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Appendix 7

SM-1A POST-DECOMMISSIONING SITE SURVEILLANCE PLAN

I. PURPOSE AND SCOPE. The purpose of this plan is to insure the integrity of the encasement structures resulting from the decommissioning of the SM-1A Nuclear Power Plant. This plan identifies those surveillance requirements that are necessary to fulfill this purpose, and provides procedures and other essential guidance for the successful conduct of this surveillance.

II. RESPONSIBILITIES

A. Alaska District, Corps of Engineers. Alaska District, CE, will be responsible for the conduct of formal structural inspections. In the event of abnormal surveillance results, Alaska District, CE, will be responsible for prompt notification of USAEPG.

B. U. S. Army Engineer Power Group (USAEPG). USAEPG will retain basic responsibility for the encased radioactive materials on the SM-1A site. USAEPG will be responsible for the conduct of this surveillance plan, to include the collection, necessary processing, and analysis of filters, dosimeters and samples. In the case of any breach of the encasement structures, USAEPG will be responsible for the restoration of integrity.

C. U. S. Army, Alaska (USARAL). Fort Greely, acting for USARAL will assume the responsibility for the routine maintenance and upkeep of the remaining SM-1A facility, to include routine maintenance of the encasement structures, and will provide continual informal structural

surveillance of the encasement structures. USARAL will also have the responsibility to promptly inform Alaska District of any significant structural abnormalities noted during the routine surveillance.

III. SITE SURVEILLANCE

A. Basis. The safe encasement of potentially hazardous radioactive materials depends upon the structural integrity of the encasement structure. While the basic integrity of the SM-1A encasement structures is provided by conservative design and well-executed construction, it is necessary that the structures be monitored for possible structural degradation during the period that the potential hazard of the encased materials is significant. Though the potential hazard is radiological in nature the protection provided is strictly structural.

Accordingly, the encasement structures themselves are the object of the surveillance. Since destructive testing is not feasible, however, and since much of the encasement structures will be subsurface and inaccessible, structural surveillance alone would not be adequate. Therefore, a less direct method of monitoring the structure is also required, specifically radiological surveillance of the structures. While radiological surveillance is directly related to the potential hazard, its purpose in site surveillance is to monitor the structures for possible leakage. An increase in radiation levels on the site, however, is not prime facie evidence that encasement integrity is degraded, and conversely, structural

degradation need not necessarily indicate an increased potential radiological hazard. Monitoring of both aspects, radiological and structural, is thus required to provide meaningful surveillance data.

B. Structural Surveillance. Structural surveillance, for routine purposes, will consist entirely of the observation of the accessible surfaces of all encasement structures. These surfaces are all external surfaces and all concrete surfaces.

The major observation areas include:

1. The above-ground outer wall of the outer vapor container, including the upper dome and particularly those areas exposed within the interior of the turbine building.

2. The top and 3 sides (the 11' above-ground) of the spent fuel pit.

3. The top and 3 sides (only about 3 feet of which are exposed above ground) of the Hot Waste Tank Pit.

4. All corners and joints, such as the spent fuel pit-vapor container juncture.

These areas will be inspected for cracks or fissures that may be due to thermal expansion-contraction cycling or weathering, concrete spalling, evidences of permeability, wet spots, displacements, or other physical or structural abnormalities.

Fort Greely, specifically Facilities Engineer personnel, who will be operating the plant site and SM-1A secondary system when necessary, will be charged with making these structural observations on a routine basis, notifying Alaska District of any significant discrepancies. Alaska District shall perform formal, periodic structural inspections

of the encasement structures.

C. Radiological Surveillance. To supplement and augment the necessarily limited structural surveillance, the post-decommissioning site will continue to be monitored to determine the radiation levels on the site. The standard device for this long-term, low-level radiation monitoring will be thermoluminescent dosimeters (TLD). These dosimeters will be placed in locations on the plant site that would be most likely to receive increased radiation exposures in the eventuality of a loss of encasement integrity that results in higher radiation levels on the site (the latter is unlikely even assuming the improbable former).

1. TLDS: A total of 60 TLDs will be installed in prepared fixtures, permanently mounted for easy access but locked to prevent unintentional removal. The locations, reflected on Figure I utilizing the same guide numbers, will be as follows:

a. On the vapor container wall in the vicinity of the pipe pit.

b. On the vapor container wall in the vicinity of the electrical penetrations.

c. On the vapor container wall below the access hatch.

d. ln the pump area (where the primary make-up tank formerly sat).

e. On the wall sealing off the inner demineralizer room.

f. On the external vapor container wall, southeast quadrant.

g. On the external vapor container wall, northeast quadrant.

h. On the outer spent fuel pit encasement wall.

i. On the top of the spent fuel pit encasement.

j. On the top of the hot waste tank pit cover (2 locations).

k. On the roof of the inner demineralizer room adjacent to the vapor container wall.

l. In the area of the former laboratory on the turbine deck.

m. At the site fence (4 locations, one on each side).

n. Inside J-5 storage building.

o. On liquid waste disposal system pump house base (not shown on map).

p. Inside Building T-300 Well #6 (representative background not shown on map).

Fort Greely will be tasked with the responsibility to periodically check the film dosimeter locations and report any discrepancies to Alaska District.

2. Air Monitoring: The remaining void between the inner and outer vapor containers will have to be vented due to the fact that the outer container cannot withstand a significant vacuum (which is conceivably possible due to rapid ambient temperature changes). This venting to atmosphere will be accomplished in a controlled fashion

DOSIMETER

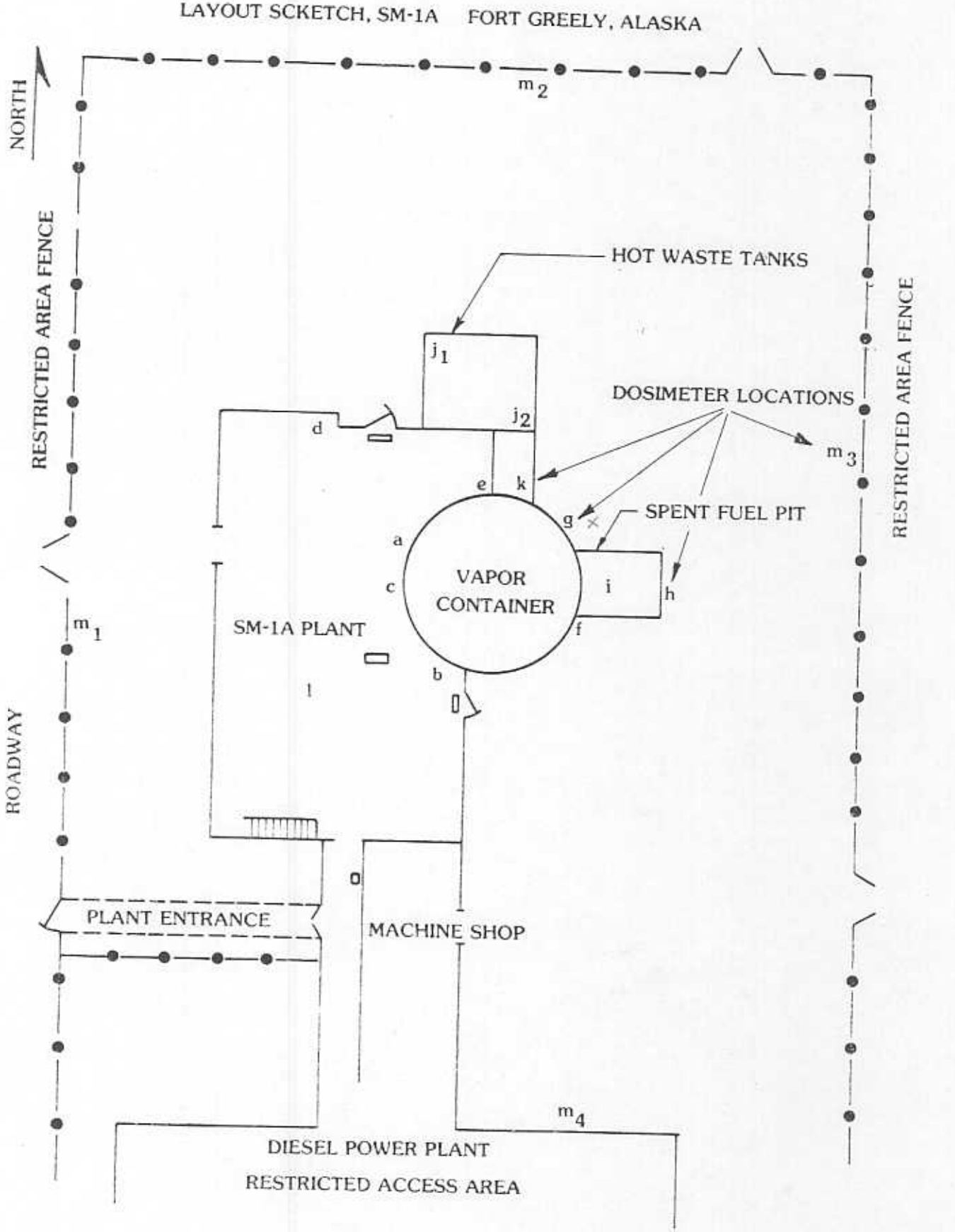

FIGURE 1

utilizing two one-way valves whose lines are equipped with charcoal filter cartridges. These valves and filters will be installed in the access hatch in the outer vapor container.

When the void is "inhaling", the entering air will come through the inlet one-way valve, and the activity deposited on that filter will represent ambient or natural background radioactivity. When the void "exhales", it will do so through the other one-way valve, and the activity deposited on this second filter will be representative of the activity in the void.

Since the inner vapor container will be sealed it is anticipated that the first (inlet) filter will always show much more activity than the outlet filter. However, this monitoring will provide assurance that the inner vapor container is (1) not "breathing" and/or (2) does not contain airborne radioactivity in its sealed atmosphere. When the inner vapor container is sealed, no measurable airborne radioactivity will be present.

3. Soil Sampling: Since the foundations of the encasement structure will be reasonably inaccessible, monitoring of the subsurface encasement structures will be accomplished by taking subsurface soil samples from soil sampling wells. Following are selected portions of the work description for the drilling of these wells:

IV. SOIL SAMPLING WELLS. The scope of this work includes the drilling of one control well and two sampling wells, and the collection of soil samples as the wells are drilled to provide samples from varying depths for radio-assay. In addition to the primary

purpose of radiological evaluation of the soils on a one-time basis, the wells will be utilized in the future to monitor the SM-1A site after the completion of decommissioning.

A. Well Location and Identification:

1. Control Well: The control well shall be one (1) open-hole fully-cased well, drilled to a vertical depth of 75 +/- 2 feet. The well shall be located not more than 450 feet nor less than 300 feet North of the SM-1A vapor container, and not more than 50 feet West or 200 feet East of a North-South line passing through the center of the vapor container. This describes a 150' by 250' area. The control well shall be identified as SS WELL #1.

2. Spent Fuel Pit Well: The spent fuel pit soil sample well shall be one (1) open-hole fully-cased well, drilled to a vertical depth of 40 +/- 1 feet. The bottom of the well hole shall be located beneath the spent fuel pit foundation, within 1 foot of a vertical line passing directly through the center of the spent fuel pit hopper. The actual casing length will be approximately 45 feet at an angle of about 18° from the vertical, dependent upon placement of the well-head. The well-head shall be located to the North-North-East of the center of the spent fuel pit, at least 8 feet from the pit wall. The spent fuel pit well shall be identified as SS WELL #2.

3. Vapor Container Well: The vapor container soil sample well shall be one (1) open-hole fully-cased well, drilled to a vertical depth of 53 +/- 3 feet. The bottom of the well hole shall be located beneath the vapor container foundation, within 2 feet of a vertical line passing directly through the center of the reactor

pressure vessel. The actual casing length will be approximately 60 feet at an angle of about 25^0 from the vertical, dependent upon placement of the well-head. The well-head shall be located to the Northeast of the center of the vapor container, at least 10 feet from the vapor container wall. The vapor container well shall be identified as SS WELL #3.

B. Well Casing Size: Each well shall be fully cased with an open bottom to permit soil-sampling. The casing shall not exceed an inside diameter of 4 inches. The finished well-head shall be provided with a readily removable cap or cover, and will be adequately protected from damage and unauthorized opening.

C. Soil Sampling:

1. Quantity: Each soil sample shall be not less than 10 grams nor more than 50 grams, and should be representative of the soil gradation of the location.

2. Frequency: Samples from SS WELL #1 shall be collected at 5 foot intervals, and at 2 foot intervals from SS WELL #2 and SS WELL #3.

3. Conditions: All soil samples shall be collected in a clean, uncontaminated sample bottle and labeled with the SS WELL number, the depth from which the sample was taken, and the sampling date. Collected samples will be delivered to the Officer-in-Charge/SM-1A.

D. Sample Tool: A sampling tool will be provided that is capable of collecting soil samples from the bottom of any soil sample well.

E. Final Well Condition: In addition to the provisions of B. above, each soil sample well-head shall be plainly and permanently marked with its identification number and well depth. Drilling logs shall be provided. A plot plan, showing final well location, angle, and depth, shall be furnished.

The radiological analysis of the soil samples from these wells will provide reasonable assurance of the integrity of those subsurface portions of the encasement structures. The wells also provide the means to detect any leaching of radioactivity from the encasement, which is a very remote possibility.

V. SURVEILLANCE SCHEDULE

A. STRUCTURAL SURVEILLANCE. Fort Greely Facilities Engineer personnel shall report any significant structural discrepancies to Alaska District promptly upon observation of such problem areas during continual informal surveillance.

Alaska District, CE, will conduct an annual structural inspection of the encasement structure. This formal annual inspection will include observation by an expert in concrete structures as well as such nondestructive in-place testing as deemed necessary by the expert inspector.

B. RADIOLOGICAL SURVEILLANCE

1. Thermoluminescent Dosimeters (TLDS). TLDs will be picked up for analysis according to the following schedule:

Dosimeter Locations	Pick-Up Frequency
a,b,c,d,e,f,g,h,i,j, k,l,ml,m2,m3,m4	Annually in July

Three (3) TLDs are installed in each dosimeter fixture. Fresh dosimeters will be placed in the dosimeter fixture at the time that an exposed dosimeter is being removed for processing and analysis.

This schedule provides for a 1 year exposure for the individual TLD with 2 back up dosimeters at each location. In the event of unusual readings, this schedule may be altered by removing the back up dosimeters to verify results.

This will provide verification for the readings at each location. Accordingly, the initial stockage of dosimeters should be at least 100.

2. Air Monitoring Filters: The two air monitoring charcoal and particulate filters will be collected annually for processing and analysis. New filters will be installed at the time of removal.

3. Soil Samples: Soil Samples shall be taken according to the following schedule:

Soil Sampling Well	Sampling Frequency
SS WELL #1	One-time only
SS WELL #2	Quarterly for the first year, annually thereafter
SS WELL #3	Quarterly for the first year, annually thereafter

These samples will be processed and, as a minimum, analyzed for gross beta gamma activity.

VI. UNSCHEDULED SURVEILLANCE REQUIREMENTS

A. NATURAL CAUSES. Additional surveillance will be required in the event of unusual natural occurrences such as significant seismic disturbance, hurricane force winds, lightning strikes, or a violent

hailstorm. USARAL will inform Alaska District of such a natural disturbance with potential effects upon the encasement integrity, or of any actual violations of encasement integrity. Alaska District will then evaluate the situation, and in consultation with USAEPG, determine what special surveillance may be required. If the determination is made that an unscheduled inspection is justified, Alaska District will perform the inspection and provide the results to USAEPG. Any further action required will be coordinated between USAEPG and the Alaska District.

Where it is apparent that corrective action is required either due to the severity of the event (such as an earthquake that does very heavy damage to Fort Greely) or due to visible structural damage, the Investigation Team described in C. below shall be employed.

B. ACCIDENT. In the event of an accident involving the integrity of the encasement structures, such as a vehicular impact, an aircraft crash, or unauthorized entry, the same procedures as for natural causes above shall apply.

C. INVESTIGATION TEAM. In the event of sabotage, severe accident, or severe natural occurrence, a special Investigation Team will proceed immediately to the site. Determination of need for this Special Investigation may be made by the Commanding Officer, Fort Greedy, by HQ, USARAL, by Alaska District, or by USAEPG. The team shall consist of representatives of USARAL, Alaska District, and USAEPG, will include at least one structural expert and two qualified health physicists equipped with appropriate radiation survey equipment. The Investigation Team will assess the damages, arrange

for immediate protective actions as required, and make recommendations concerning permanent corrective action. If radiological safety is involved, the Direct, USAEPG, shall have over-all responsibility for the restoration of the site to a level of safety equivalent to that of the site as initially turned-over to USARAL following decommissioning.

VII. REPORTS

A. SCHEDULED REPORTS. Alaska District will provide USAEPG a quarterly report for the first year, and a semi-annual report thereafter, which contains all appropriate surveillance data (for all surveillance scheduled for that quarter or six month period as required by IV. above), written in sufficient detail to allow a thorough analysis of the data without the requirement for supplementary information. This includes a written report from the structural inspector, as well as all pertinent sample processing and analysis data along with the results.

Alaska District will also prepare an annual report, summarizing the results of the semi-annual reports (or quarterly reports for the first year). This Annual Site Surveillance Report will be provided according to the following distribution list:

1 cy	USARAL HQ (RPO)
2 cys	Fort Greedy (CO)
1 cy	OCE (Safety Office)
4 cys	USAEPG (Dir)
2 cys	Army Materiel Command

B. UNSCHEDULED REPORTS. Reports of the circumstances and results of any special surveillance will be forwarded to USAEPG upon completion of the special requirements. These are reports for situations not involving the special Investigation Team. In cases

where abnormal results arise or where some physical corrective action is recommended, this report shall reach USAEPG within thirty (30) days of the call for special surveillance.

In cases where the Investigation Team is properly called for a severe situation, the Team shall prepare a comprehensive report to be distributed to the list of A. above vithin 15 days of the occurrence. This report shall contain all pertinent circumstances and facts, all survey results, a complete description of the damage, an analysis of the hazards involved, a listing of all actions taken, and recommended follow or permanent actions.

C. REPORTS SCHEDULE. Alaska District quarterly or semi-annual reports to USAEPG will reach USAEPG within 60 days of the end of the quarter or half-year. Quarters are defined by 15 February, 15 May, 15 August, and 15 November; half-years by 15 February and 15 August; and years by 15 February.

The Alaska District's Annual Site Surveillance Report, based on the surveillance year 15 February - 14 February, will be distributed to the list of A. above not later than 1 April.

VII. SITE SURVEILLANCE PLAN REVIEW. This site surveillance plan will be reviewed annually by USAEPG and Alaska District to determine its effectiveness and whether its scope is proving to be inadequate or excessive. Recommended changes that involve a significant reduction in scope will be provide by the Safety Office of OCE prior to implementation of the change. This review will occur in the first calendar quarter of the year. Five years following decommissioning, an in-depth review will be conducted, involving Alaska District,

USARAL, USAEPG, and the OCE Safety Office to determine, in light of the five years of data, what future site surveillance requirements should be done.

MH-1A POST DECOMMISSIONING

SITE SURVEILLANCE PLAN

U. S. ARMY
FACILITIES ENGINEERING SUPPORT AGENCY
FORT BELVOIR, VIRGINIA

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A. SHIP SURVEILLANCE PROGRAM

The MH-1A Nuclear Power Plant ceased operation in July 1976. Decommissioning of the MH-1A began at Fort Belvoir, Virginia, in April 1977 and, when finished, the following major actions will have been completed.

1. All fuel assemblies, control rods, pressure vessel surveillance samples, poison finger rod assemblies, and core poison pins as well as all radioactive liquids and wastes will be removed from the site.

2. All tanks which contained radioactive fluids will be emptied, cleaned, closed and sealed.

3. All penetrations (pipes, electrical cables, instrumentation leads, etc.) through the containment vessel will be disconnected or cut, blank flanged or capped and sealed.

4. The containment vessel access door will be closed and sealed, the secondary shield plug will be placed in position and the lifting equipment will be disabled.

Thus, all residual radioactive material on board the STURGIS will be confined to the following restricted access areas; the containment vessel, the spent fuel storage tank, and the reactor access compartment. Figure 1 shows the location of these areas on the STURGIS and Figure 2 shows the restricted area accesses. A two-part ship surveillance program will be conducted to insure the integrity of the boundaries of these restricted access areas. The two parts are structural survey and facility radiation survey.

1.0 STRUCTURAL SURVEY

En route from Fort Belvoir to the James River Reserve Fleet, the STURGIS will enter a drydocking facility for additional work preparatory to long-term storage. Among the tasks to be performed are the exterior painting (above and below the waterline), the sealing of all hull penetrations, the closing of all topside penetrations, the installation of a dehumidification system for the vessel interior and the installation of additional cathodic protection for the hull.

There are three structural barriers between the radioactive material on board the STURGIS and the areas of the vessel which are accessible. These barriers are (1) the locked or secured entrances to the refueling room, (2) the sealed restricted area access and (3) the sealed containment vessel and tanks containing the material. As long as these barriers remain intact there will be no radioactive releases from the STURGIS.

Since all exterior penetrations through the hull will have been closed and all other means of access either locked or sealed, the structural survey of the STURGIS will consist of the following:

1. Assure that all entrance hatchways (doors) into the STURGIS are secured and sealed or are locked.

2. Assure that the gangway and entrance ways have functioning intrusion alarms with remote audible and visual signals.

3. Security personnel will visually check the STURGIS from a small boat at least once during each 24-hour period at various unscheduled intervals. This patrol will be active during the hours of darkness, on weekends, on holidays and other times when the normal fleet personnel are off-site.

4. At least once each calendar quarter the seals and locks on the restricted area accesses will be inspected, and all ship intrusion alarms will be tested.

5. At least once each calendar year an underwater inspection of the hull will be conducted.

6. At least once each calendar quarter the installed sounding tubes will be used to monitor the bilge and ballast tanks for accumulation of water.

7. At least once each calendar quarter the vessel interior will be inspected for evidence of water accumulation due to structural leaks.

8. The STURGIS will be drydocked after five years for a thorough inspection. The data gathered will be used to program future drydocking requirements and intervals to insure long-term structural integrity.

2.0 RADIOLOGICAL SURVEY

2.1 ROUTINE SURVEY

To supplement the structural surveillance program, the interior of the STURGIS will be monitored to determine on-board radiation levels. This monitoring will be performed using thermoluminescent dosimeters and air samplers.

2.1.1 THERMOLUMINESCENT DOSIMETERS (TLD's)

The TLD's will be placed in locations which would be most likely to receive increased radiation exposure in the unlikely event of a change in the "as stored" condition. The changes could result in higher radiation levels outside the restricted access areas on board the STURGIS. Not less than five TLD chips will be placed in each location. Chip holders will be secured against movement with masking tape, or may be contained in additional improvised holders or boxes. The TLD locations, reflected in Figure 3 using the same guide numbers, will be as follows:

a. On the top of the containment vessel dome.

b. On the top of the spent fuel storage tank.

c. On the top of the concrete plug covering the access to the reactor access compartment.

d. In the radiochemical lab area of the refueling room

e. On the forward refueling room wall

f. On the starboard refueling room wall

g. On the port refueling room wall

h. On the aft wall of the control room

i. On the aft wall of the instrument shop

j. On the aft wall of the auxiliary machinery room

k. On the aft mess room wall

l. In the pilot house

m. On the forward wall of the electrical distribution room

n. On a ship or on shore not less than 500 yards from the containment vessel. (Location must be negotiated with MARAD.)

Three chips shall be read and the average of the three values used as the true value. The balance of the chips should be held for thirty days in the event confirmation of the readings is necessary.

2.1.2 AIR SAMPLES

The concentration of long-lived airborne radioactivity should remain relatively constant on board the STURGIS since all exterior penetrations are sealed. Any increase in these concentrations would therefore come from within the STURGIS and would necessitate investigation. For monitoring purposes, samples of 1000 to 1500 cubic feet will be taken in the refueling room (three samples, one in the old radiochemical lab area, one near the containment vessel dome, and one on the fan deck near the spent fuel storage tank cover), the control room, the auxiliary machinery space, the mess hall and the pilot house.

While the air sampler is running, the radiation signs will be examined and any which are not easily readable will be replaced.

2.1.3 FREQUENCY

The routine radiological survey program detailed above will be conducted quarterly for the first three years of anchorage in the James River Reserve Fleet and annually thereafter. When TLD's are removed for reading, replacements shall be placed in the locations.

2.2 SPECIAL SURVEY

From time to time, circumstances may necessitate performing special radiological surveillance on board the STURGIS. Examples of circumstances which would require special radiological surveillance are: evidence of water accumulation in ship compartments, evidence of tampering with the restricted access area closures and flooding of a ship compartment.

When required, these special radiological surveys will be performed by personnel from or a representative of the U. S. Army Facilities Engineering Support Agency, Fort Belvoir, Virginia.

B. ENVIRONMENTAL SURVEILLANCE PROGRAM

An environmental surveillance program will be conducted in order to detect any increase in the existing radioactivity levels which may be indicative of a breach in the protective barriers or their closures. Samples of the environmental media most likely to be affected by a radioactivity release will be collected at location(s) near the restricted access areas.

1.0 INITIAL SURVEY

Prior to the arrival of the STURGIS or not more than ten days following mooring in the James River Reserve Fleet, environmental samples in the vicinity of the STURGIS berth will be taken to characterize the background radioactivity concentrations in the river water and bottom sediment. For this purpose, the berth will be divided into eight sectors by halving the berth approximately on the line connecting the mooring buoys and dividing the area between buoys into four parts. These areas shall be identified as left and right and numbered one through four. All determinations will be made while facing upstream. A water sample of not less than two liters shall be drawn from each area. Samples shall be drawn from a depth not to exceed one meter approximately at slack high tide and approximately 20 meters from the halving line. Sediment samples of not less than 25 grams shall be drawn from locations approximately identical to those of the water samples. Precautions should be taken to assure sampling not deeper into the sediment than 20 centimeters and to assure that the surface fraction of sediment is included in the sample and not lost as turbidity to the water. Samples shall be dated, identified by the designation of the area from which they were drawn and shall be transported in containers which will assure sample integrity. A portion of each sample sufficient for separate analysis shall be held for 30 days in the event confirmation of results is needed.

2.0 ROUTINE SURVEY

Water and sediment samples shall be drawn from two areas (as defined for initial sampling program) approximately 3 meters outboard of the STURGIS hull for each survey. Areas shall be R3 and L2 for the odd numbered surveys and R2 and L3 for the even numbered surveys. Samples shall be collected, identified and handled as specified for initial samples.

The samples will be collected quarterly for the first three years of mooring in the James River Reserve Fleet and annually thereafter. When sampling annually, samples will be drawn from all four sampling areas.

3.0 SAMPLE ANALYSIS

Samples will be collected, processed and counted using, as a guideline, the methods specified herein and the methods outlined in USAFESA's Health Physics - Process Control Reference Manual, dated 1 July 1966 (as amended) or equivalent. In the event an individual sample shows abnormally high activity, the following action will be taken:

1. The counting system reliability will be verified and the withheld portion of the sample will be processed and counted.

2. If this confirms the results of the first analysis, additional samples will be taken to verify the condition.

3. If the condition is verified, an investigation will be conducted by FESA to determine the source of the radioactivity. If it is determined that the STURGIS is the source, FESA will initiate action to correct the situation.

4. FESA will prepare a special report which describes the occurrence and the investigative results. This report will be forwarded to ARCHS as specified in the Administrative Controls section.

C. ADMINISTRATIVE CONTROLS

1.0 ADMINISTRATIVE RESPONSIBILITY

When relocated and moored, the STURGIS will be in the custody of the Superintendent of the James River Reserve Fleet who will be responsible for security control and structural surveillance.

Environmental sampling, radiation surveys and laboratory analyses will be performed by qualified personnel from USAFESA or its contractor. The qualifications for these personnel shall be one year of specialized training in health physics or equivalent including training in environmental sampling and three years of work experience related to radiological health and safety.

USAFESA will be responsible for administration of the Department of the Army Radioactive Material Authorization for the residual radioactive material confined on board the STURGIS.

2.0 RECORDS

The following records will be maintained by FESA;

2.1 RADIATION SURVEILLANCE LOG

This log shall contain the records of collection and replacement of TLD's, collection of air samples, collection of water and sediment samples, equipment used and the names of individuals doing the sampling. Date, time and weather conditions should be shown.

2.2 REPORTABLE INCIDENT LOG

This log shall contain date, time and summary of incident, name of discovering individual, circumstances of discovery, date and time of results of investigation.

2.3 REPORT FILES

The files shall contain copies of the following reports.

1. Structural survey report
2. Routine radiological survey report
3. Accident or incident report
4. Special radiological survey report
5. Initial environmental survey report
6. Routine environmental survey report
7. Reportable Occurrence report
8. Variance report
9. Annual report

3.0 VISITORS

Any visitor on board the STURGIS will be accompanied by individuals representing FESA or MARAD.

4.0 REPORTING

The following reports shall be made by the individual or agency stated herein. Minimum distribution of any report shall be to FESA-HQ and MARAD-JRRF-HQ.

4.1 STRUCTURAL SURVEY REPORT

Prepared by MARAD organizational element responsible for evaluating collected data and making the necessary recommendations. Report shall include a summary of the conduct of the survey, evaluation of data, and conclusions or recommendations as a result of data evaluation.

4.2 ROUTINE RADIOLOGICAL SURVEY REPORT

Prepared by FESA organizational element responsible for collecting samples, analysis of samples, evaluating the analysis and making necessary recommendations. Report shall include a summary of collecting, analysis, and conclusions or recommendations as a result of evaluations. Data sheets shall be appended.

4.3 ACCIDENT OR INCIDENT REPORT

Prepared by individual in responsible charge of the person or group discovering the accident or incident. Included are all events defined as accidents or incidents by MARAD or FESA not included in Reportable Occurrences or Special Surveys. Report shall contain a summary of the discovery or occurrence of the accident or incident and the outcome or resultant events.

4.4 SPECIAL RADIOLOGICAL SURVEY REPORT

Prepared by FESA organizational element responsible for conducting the sampling, analysis of samples, evaluating the analysis and making necessary recommendations. Report shall include collecting, analysis and conclusions or recommendations as a result of evaluations. Data sheets shall be appended.

4.5 ENVIRONMENTAL SURVEY REPORTS

Preparation and content shall be as stated for Routine Radiological Survey Report.

4.6 REPORTABLE OCCURRENCES

A reportable occurrence report shall be made to the Chief of Engineers, DAEN-FEZ, by telephone within 24 hours of a reportable occurrence. A written report of the investigation and conclusions shall follow as soon as practicable. Reportable occurrences are as follows:

1. The entrance of an unauthorized person or persons into the restricted access areas.

2. A significant change in the radiation levels in the facility.

3. Any grounding of the vessel due to severe weather conditions or abnormal occurrences.

4. Major flooding or sinking of the STURGIS. (Major flooding is defined as the flooding of at least one major ship compartment. The STURGIS is designed to remain afloat with two major compartments flooded.)

4.7 VARIANCE REPORT

Any substantial variance of the conditions of the facility from those described in the application for Department of the Army Radioactive Material Authorization shall be reported in the same manner and channels as Reportable Occurrences.

4.8 ANNUAL REPORT

Prepared by FESA organizational element in responsible charge of monitoring all operations concerning the STURGIS. Content and distribution shall be as specified in the STURGIS Technical Specifications and in accordance with AR 385-80.

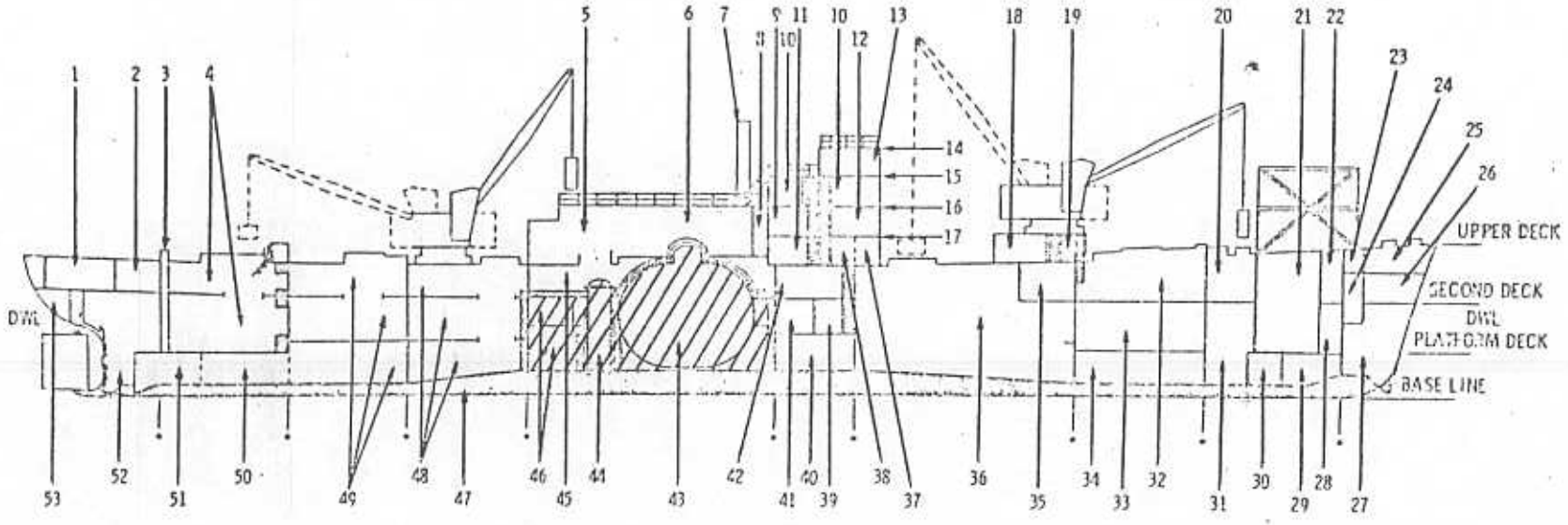
5.0 SURVEY PERIODS AND INTERVALS

Quarterly means covering the period of a calendar quarter. The actual interval shall not be less than 11 weeks nor greater than 15 weeks.

Annually means covering the period of a calendar year. The actual interval shall not be less than 11 months nor greater than 14 months.

FIGURE 1

MH-1A INBOARD PROFILE



NOTE:
- INDICATES WATERTIGHT BULKHEAD
- STAIRWAY
- CONCRETE
- PASSAGEWAY

Restricted Areas

LEGEND:

1. STEERING GEAR ROOM
2. UNASSIGNED SPACE
3. ESCAPE TRUNK
4. REPAIR PARTS STOWAGE
5. DECONTAMINATION AREA AND RADIOCHEMICAL LABORATORY
6. REFUELING ROOM
7. NUCLEAR EXHAUST STACK
8. EMERGENCY WATER STORAGE TANK
9. GALLEY (PORT SIDE) AND MESS ROOM (STARBOARD SIDE)
10. STATE ROOM
11. REFRIGERATOR AND GALLEY
12. OFFICE
13. PILOT HOUSE
14. PILOT HOUSE TOP
15. NAVIGATING BRIDGE DECK
16. UPPER BRIDGE DECK
17. BRIDGE DECK
18. FAN ROOMS (PORT AND STARBOARD SIDES) AND PAINT, OIL, AND LAMP LOCKER (CENTER)
19. DECK LOCKER
20. TRAVELLING SCREEN ROOM
21. TRANSFORMER WELL
22. CHLORINATING ROOM
23. CARPENTER SHOP
24. CHAIN LOCKER
25. BOATSWAIN'S STORES
26. ROPE AND HAWSER STOWAGE
27. FORE PEAK TANK
28. VOID
29. DIESEL FUEL OIL TANKS
30. FREE FLOODING SPACE (WATER INTAKE)
31. TRAVELLING SCREEN WELL
32. SWITCHGEAR AND ELECTRICAL DISTRIBUTION ROOM
33. DIESEL GENERATOR ROOM
34. MAIN INJECTION ROOM
35. MAINTENANCE SHOP
36. MAIN MACHINERY ROOM (INCLUDING TURBINE GENERATOR)
37. LOCKER
38. FAN ROOM (PORT SIDE) AND PASSAGEWAY (STARBOARD SIDE)
39. INSTRUMENT SHOP
40. AUXILIARY MACHINERY ROOM
41. COUNTING ROOM
42. CONTROL ROOM
43. CONTAINMENT VESSEL
44. SPENT FUEL TANK
45. STORAGE AREA AND FAN ROOM
46. REACTOR ACCESS COMPARTMENT
47. HULL BOTTOM TANKS
48. STOWAGE (SHORE TOWER AND CABLES)
49. BULK STOWAGE
50. SHAFT ALLEY AND BULK STOWAGE
51. TUNNEL RECESS
52. AFT PEAK TANKS
53. VOID

FIGURE 2

MH-1A REFUELING ROOM

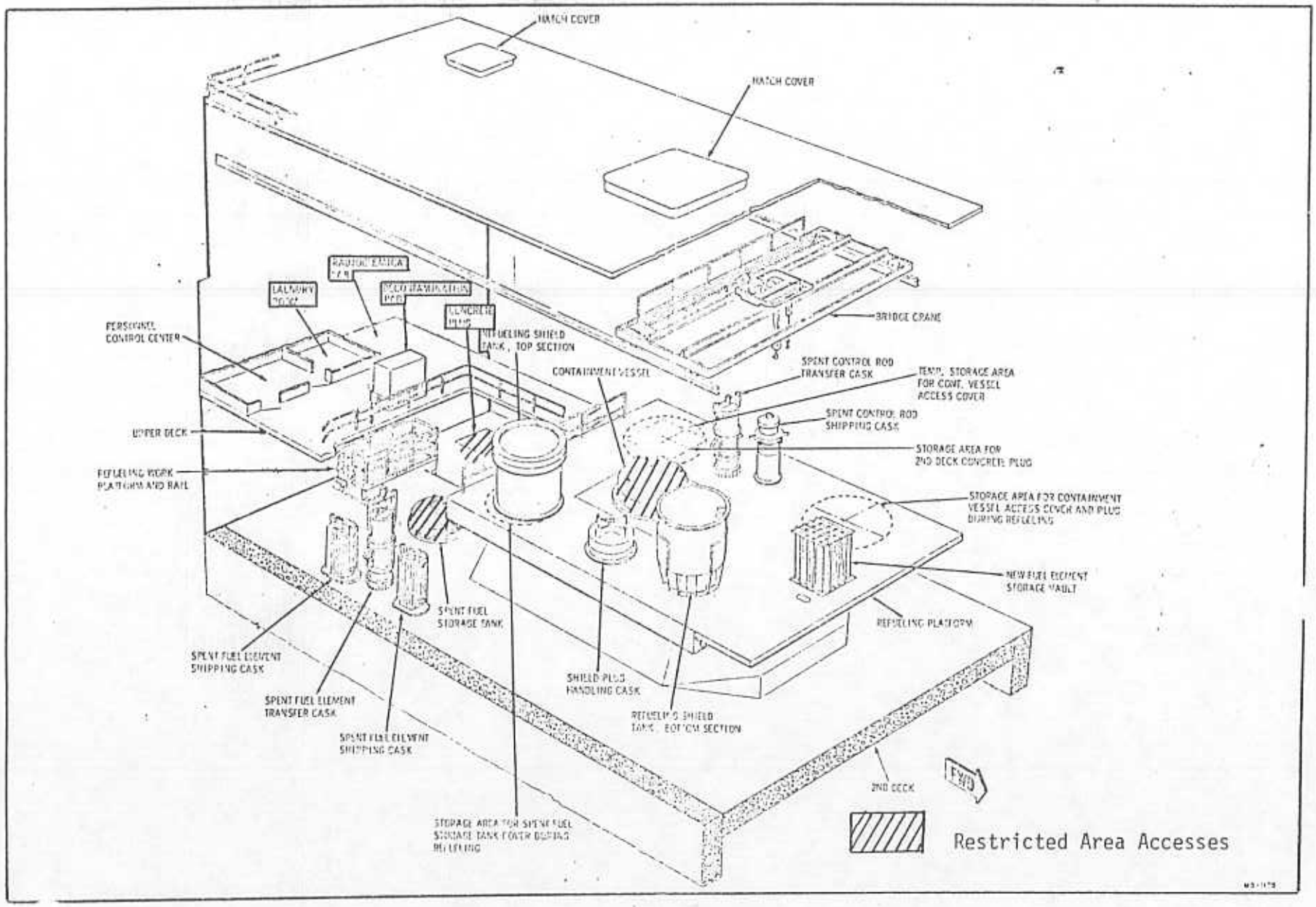
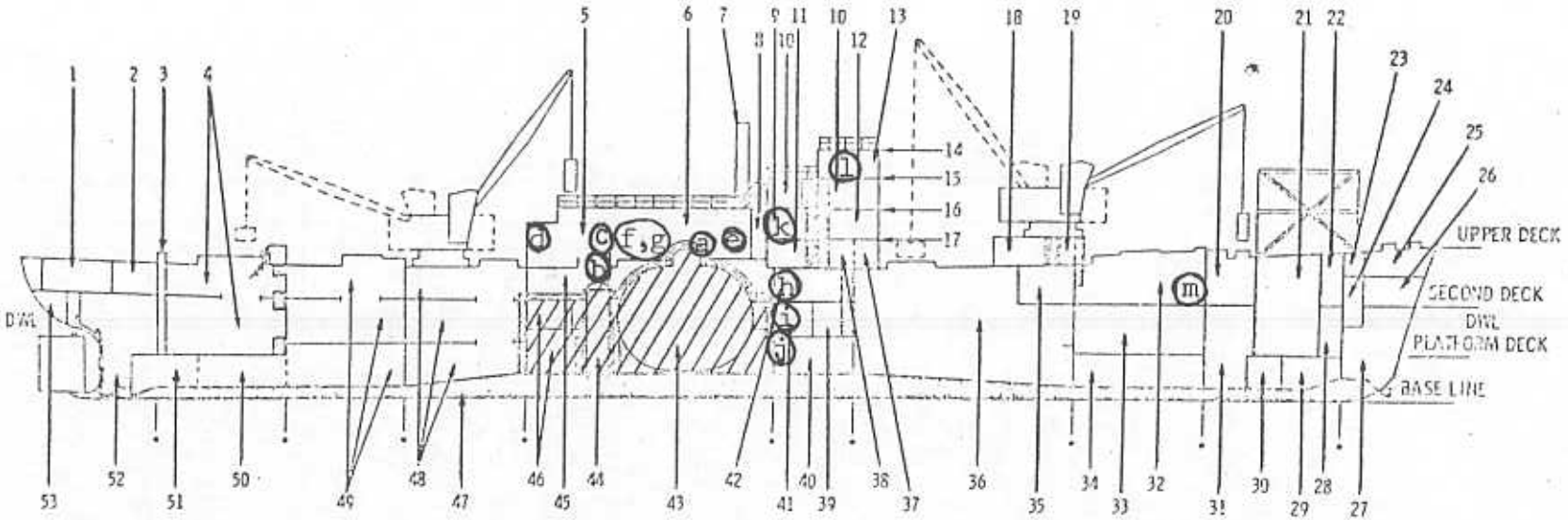


FIGURE 3

THERMOLUMINESCENT DOSIMETER LOCATIONS



NOTE:
- INDICATES WATERTIGHT BULKHEAD
- STAIRWAY
- CONCRETE
- PASSAGEWAY

Restricted Areas

LEGEND:

1. STEERING GEAR ROOM
2. UNASSIGNED SPACE
3. ESCAPE TRUNK
4. REPAIR PARTS STOWAGE
5. DECONTAMINATION AREA AND RADIOCHEMICAL LABORATORY
6. REFUELING ROOM
7. NUCLEAR EXHAUST STACK
8. EMERGENCY WATER STORAGE TANK
9. GALLEY (PORT SIDE) AND MESS ROOM (STARBOARD SIDE)
10. STATE ROOM
11. REFRIGERATOR AND GALLEY
12. OFFICE
13. PILOT HOUSE
14. PILOT HOUSE TOP
15. NAVIGATING BRIDGE DECK
16. UPPER BRIDGE DECK
17. BRIDGE DECK
18. FAN ROOMS (PORT AND STARBOARD SIDES) AND PAINT, OIL, AND LAMP LOCKER (CENTER)
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20. TRAVELLING SCREEN ROOM
21. TRANSFORMER WELL
22. CHLORINATING ROOM
23. CARPENTER SHOP
24. CHAIN LOCKER
25. BOATSWAIN'S STORES
26. ROPE AND HAWSER STOWAGE
27. FORE PEAK TANK
28. VOID
29. DIESEL FUEL OIL TANKS
30. FREE FLOODING SPACE (WATER INTAKE)
31. TRAVELLING SCREEN WELL
32. SWITCHGEAR AND ELECTRICAL DISTRIBUTION ROOM
33. DIESEL GENERATOR ROOM
34. MAIN INJECTION ROOM
35. MAINTENANCE SHOP
36. MAIN MACHINERY ROOM (INCLUDING TURBINE GENERATOR)
37. LOCKER
38. FAN ROOM (PORT SIDE) AND PASSAGEWAY (STARBOARD SIDE)
39. INSTRUMENT SHOP
40. AUXILIARY MACHINERY ROOM
41. COUNTING ROOM
42. CONTROL ROOM
43. CONTAINMENT VESSEL
44. SPENT FUEL TANK
45. STORAGE AREA AND FAN ROOM
46. REACTOR ACCESS COMPARTMENT
47. HULL BOTTOM TANKS
48. STOWAGE (SHORE TOWER AND CABLES)
49. BULK STOWAGE
50. SHAFT ALLEY AND BULK STOWAGE
51. TUNNEL RECESS
52. AFT PEAK TANKS
53. VOID

APPENDIX A

SM-1 POST DECOMMISSIONING ENRADMON PLAN

A. General

1. The post decommissioning ENRADMON Plan as contained in this appendix is intended to be implemented after all decommissioning and conversion activities are completed. Baseline data will be established by final site surveys. The surveys are to be performed by FESA personnel and an outside organization. Additionally, the environmental data accumulated over the years will be utilized for background information.

2. RESPONSIBILITY: This plan applies to the Post-Decommissioned SM-1 Site, and its implementation is the responsibility of the USAFESA.

3. FREQUENCY: The frequency of monitoring and inspections will be as listed in Tables A-1 and A-2 of this monitoring plan. The frequency schedule may be changed with the approval of ARCHS, based upon the data obtained and a statistical evaluation of the results.

4. REPORTS:

a. Log: A permanent log of all monitoring will be maintained. Each entry will contain as minimum:

(1) The name of the individual performing the monitoring.

(2) The date the monitoring was performed.

(3) The sample/reading locations, the data associated with each, and statistical evaluation of the data. All data will be evaluated at Engineering Division. The printout record will be the official log with the required information attached.

(4) Comments on high data.

(5) Comments on visual inspection of the area.

(6) Corrective action.

b. Annual Report: An annual report showing the results of analysis and inspection will be forwarded to ARCHS for review.

c. Special Reports: An abnormal occurrence report will be made to DAEN-SO (ARCHS) within 24 hours and a written report within 30 days after discovery of the following:

(1) Releases of radioactivity resulting in doses or concentrations in excess of those set forth in 10CFR20.105 and 20.106. The concentrations released to the uncontrolled area shall be averaged on a monthly basis instead of a yearly basis.

(2) Unusual low-level releases of radioactive material from the site boundary which are not reported under 4.c.(1) above.

(3) The abnormal occurrence(s) will also be reported in the annual report.

d. Permanent Records/Logs: The following records/logs will be kept and retained permanently:

(1) Environmental surveys.

(2) Facility radiation protection surveys.

(3) Inspections of physical barriers.

(4) Abnormal occurrences.

5. EMERGENCY CONSIDERATIONS

a. Emergency procedures to be considered in a decommissioned nuclear plant, in addition to normal industrial emergencies, are those that could conceivably cause the release of radioactivity as either spreadable contamination, liquid or solid and airborne particulates. For the decommissioned SM-1, in its final site condition, the only emergency that could result in the release of radioactivity to the environment would be fire. The fire would have to involve the restricted areas, however, extreme measures have been taken to insure that virtually all material that could fuel a fire in the restricted areas have been removed. The restricted area will be isolated from the other areas of the building by locked doors and all electrical power will be out of service. Personnel will enter the restricted area only for monitoring purposes. Air circulation within the restricted area will be minimal (convection and leakage). With approximately 99.9% of the total radioactivity permanently sealed within the vapor container, the quantity of radioactive materials available for transport is significantly reduced.

Security measures of the restricted areas are detailed on page 7 of the Decommissioning and Conversion Plan for the SM-1 Nuclear Power Plant. (See Appendix C, reference 2, page C-12.)

The following procedure will be followed in case of fire:

1 - Evacuate the building.

2 - Notify the Fire Department and alert them to the possibility of radioactive releases.

3 - Notify the Deputy Commander and Director who inturn will obtain health physics assistance.

4 - The HP will set up air monitoring equipment outside the building in the downwind direction. Control points will be set up if necessary.

b. All other emergencies such as floods, earthquakes and other occurrences have been appraised in the decommissioning plan and are not considered to be applicable. Should it be determined that an unsafe condition exists, it is the responsibility of the USAFESA to alleviate the condition and restore the site to a safe configuration. The following equipment shall be on hand for use in emergencies:

1 - Monitoring equipment

2 - Breathing equipment

3 - First Aid

4 - Keys shall be made available to MERDC guard, Fire Department and at the SM-1.

B. Scope of Program

1. Restricted areas.

2. Unrestricted areas within reactor facility boundaries (Fence Line).

3. Offsite, on-post, external to reactor facility boundaries.

C. Procedures

1. TYPE AND SIZE OF NUCLEAR REACTOR: The SM-1 was a 10.77 megawatt-thermal nuclear power plant with a design capacity of 2,000 kilowatts of electricity. The reactor fuel was uranium oxide (UO^2) highly enriched in the isotope 235^u, and clad in stainless steel. Water under pressure served as both a moderator and primary coolant. Heat was transferred to an independent secondary system in a steam generator located within the containment vessel.

2. LOCATION: The SM-1 nuclear power plant site is located at Fort Belvoir, Virginia, within the bounds of the Mobility Equipment Research and Development Center (MERDC). Figure A-1 is a map of the MERDC area which shows the location of the SM-1. The Fort Belvoir Military Reservation is located on a peninsula on the western shore of the Potomac River approximately 17 miles south-southwest of Washington, D.C. The peninsula is bordered on the northeast by Dogue Creek, on the east by the Potomac River, and on the southwest by Gunston Cove.

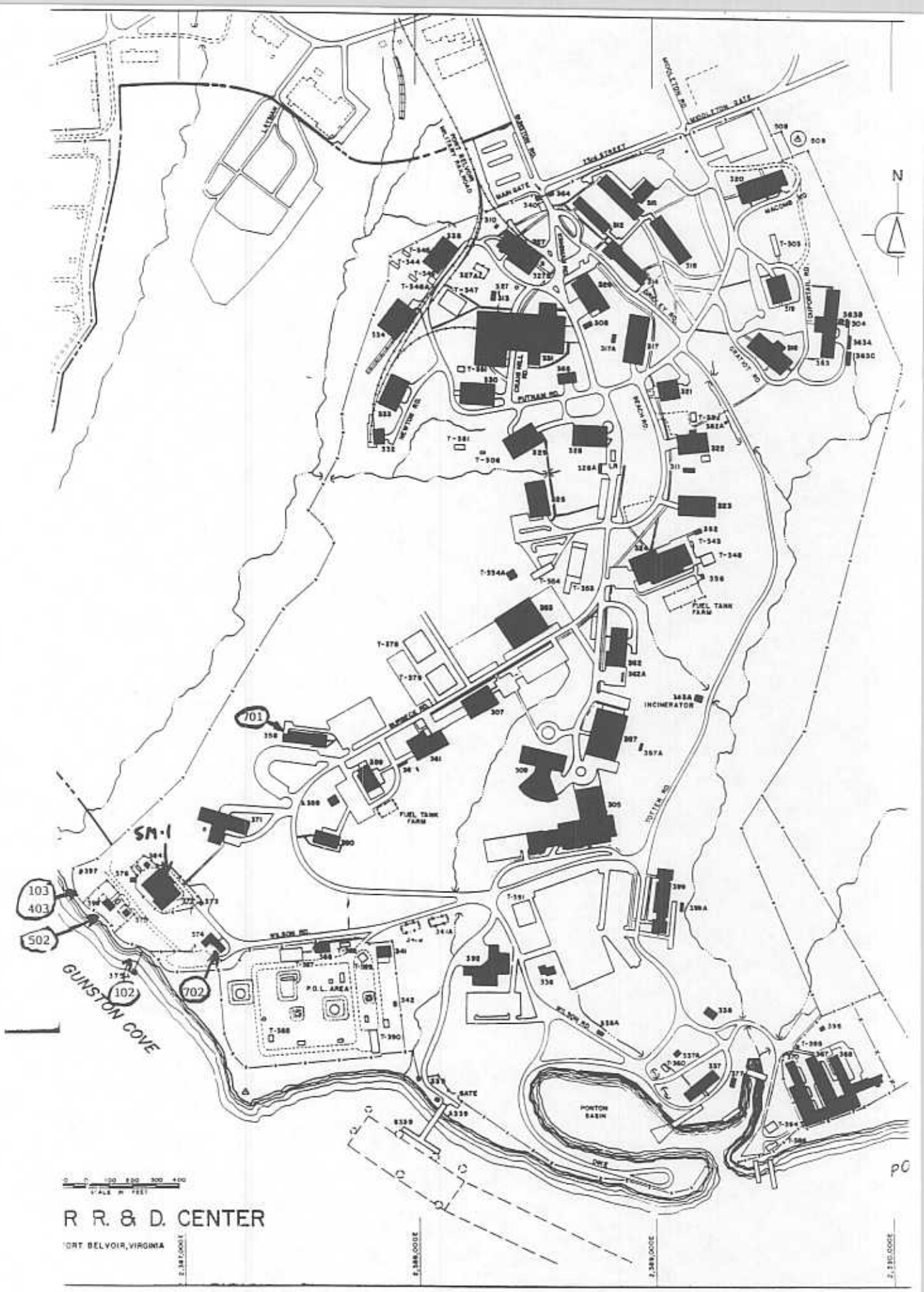
N
SM-1
701
702
103
403
502
102
GUNSTON COVE
R R. & D. CENTER
ORT BELVOIR, VIRGINIA
FUEL TANK FARM
INCINERATOR
POL AREA
PONTON BASIN
GATE
WILSON RD.
PUTNAM RD.
BEACH RD.
TOTTEN RD.
MAIN GATE
MACOMB RD.
GRATIOT RD.
MIDDLETON RD.
15th STREET

FIGURE A1

3. CLIMATE: Summers are warm and humid and winters are generally mild; pleasant weather prevails in the spring and autumn. The coldest weather occurs in late January and early February, with average low temperatures in the upper 20^{0}'s and in the middle 40^{0}'s Warmest weather normally occurs during July with an average high temperature in the upper 80^{0}'s.

No wet and dry seasons exist; the normal annual precipitation of about 41 inches is well distributed throughout the year. The average snowfall is 17.1 inches. Winds are usually light (4-15 miles per hour) prevailing from the south during the summer and from the northwest during the winter.

4. POPULATION AND LAND USE: The nearest living quarters are located within the Fort Belvoir military reservation at Fairfax Village (approximately 880 meters from the reactor site). The population of Fairfax Village is about 600. Military personnel at Fort Belvoir total approximately 21,000 of whom about 7300 live on post with their dependents. A civilian work force of approximately 5500 is employed on post.

Metropolitan Washington has a population of approximately 2.2 million, most of whom reside within a 20-mile radius of the SM-1 reactor site. No significant variation of the population distribution with season has been observed.

The areas outside the Fort Belvoir Reservation are rural residence and urban development areas. In addition, some of the areas outside Fort Belvoir are occupied by other military establishments. It can be expected that continued urbanization will occur in the area surrounding the Fort Belvoir Reservation especially to the north of the SM-1 site.

5. HYDROLOGY AND WATER USE: At Fort Belvoir, the Potomac River is approximately one mile wide with the center of the navigational channel about 600 feet from the Virginia shore. The navigational channel is about 600 feet wide with a depth varying from 30 - 60 feet at mean low water.

Of immediate interest is Gunston Cove which is a shallow tidal estuary with an area of approximately 3.5 square miles. The water depth in the cove varies from 3 feet (at mean low water) at its mouth to a maximum depth of 6 - 7 feet (at mean low water) in the large oval depression in the center of Gunston Cove. A large submerged sand bar extends about 80 percent of the distance across the mouth of the cove. Gunston Cove and this section of the Potomac River are subjected to tidal effects with a mean tidal range of about two feet.

There is no place south of Washington known to utilize Potomac River water as a source of potable water. The populations center of interest and their source of water are presented in Table A-1.

TABLE A-1

WATER SOURCES OF LOCAL POPULATION CENTERS

Population Center	Water Source
Arlington	Obtains water from Washington, and uses a few wells in addition.
Alexandria miles	Uses a water shed and lake several from the Potomac River.
Fort Belvoir	Obtains potable water from the Occoquan Reservoir.
Indian Head	Uses pumped wells, with some industrial use of direct water from upstream.
Quantico	Obtains water from a filtration plant and from a surface impoundment in a stream running through the reservation.
Colonial Beach	Obtains water from artesian wells.

6. Other sources of radiation exist in the vicinity of the site which may contribute to total dose, however, they are not considered to be of any significance.

7. Sampling and/or instrument locations are described below and are tabulated in Table A-2.

a. Restricted Area:

(1) Air Sampling: Air samples will be taken in the general MOD area, spent fuel pit area, demineralizer room and the vapor container (via the breather vent). Concurrently, a sample will be taken at the guard shack for background. Sampling frequency, volumes, etc., are specified in Table A-3. Sample points are shown in Figures A-2 and A-3.

If any of the restricted area concentrations are abnormally high, as compared to background, an isotopic identification will be performed to determine what hazard exists.

Additionally, air will be sampled in the control room, turbine deck and front office area to insure that the airborne activity does not exceed the MPC for unrestricted areas as specified by 10CFR20.

NOTE: During the last phase of decommissioning and conversion, air will be sampled and readings taken in all areas to establish baseline data for the final posture of the plant.

(2) Radiation readings: Radiation levels will be monitored with TLD's and the data recorded for the locations shown in Figures A-2 and A-3. Radiation levels significantly higher than background are expected in the restricted area but with time should show a definite decrease.

(3) Smear Samples: Smear samples (wipe tests) will be taken at the locations shown in Figures A-2 and A-3. Sampling specifications are shown in Table A-2. Any smear-sample showing abnormally high spreadable activity will be cause for more extensive sampling to determine the extent and magnitude of the contamination.

(4) Visual inspection of the area.

b. Unrestricted Area:

(1) Air Sampling: Air sampling in the unrestricted area will not be necessary except as specified under the circumstances in a.(1).

(2) Radiation readings: Radiation levels will be monitored and the data recorded for the locations shown in Figures A-2 and A-3. Radiation levels appreciably higher than background will be cause for further investigation as to the nature of the hazard.

(3) Smear Samples: Smear samples will be taken at the locations shown in Figures A-2 and A-3. Any smear sample data showing appreciably higher than baseline spreadable activity will be cause for more extensive sampling to determine the extent and magnitude of the contamination.

c. Off-site, on-post areas:

(1) River water samples - Two samples will be taken at the locations shown in Figure A-1.

(2) Sediment - One sample will be drawn near the old SM-1 outlet. The location is shown in Figure A-1.

(3) Soil - One sample will be taken behind the old SM-1 waste facility. The location is shown in Figure A-1.

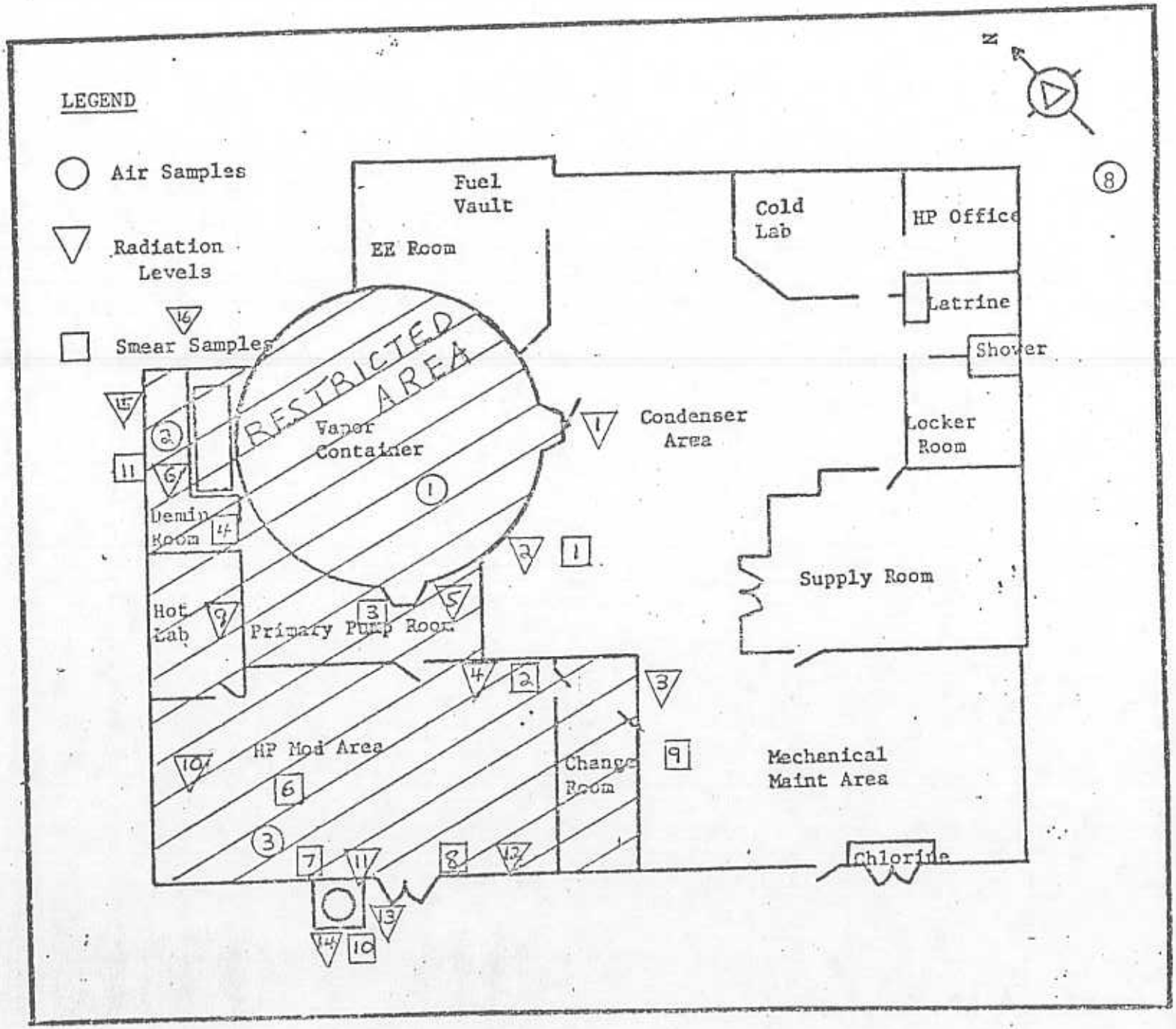

Figure A 2

Post Decommissioning Sample Locations
SM-1 Ground Floor

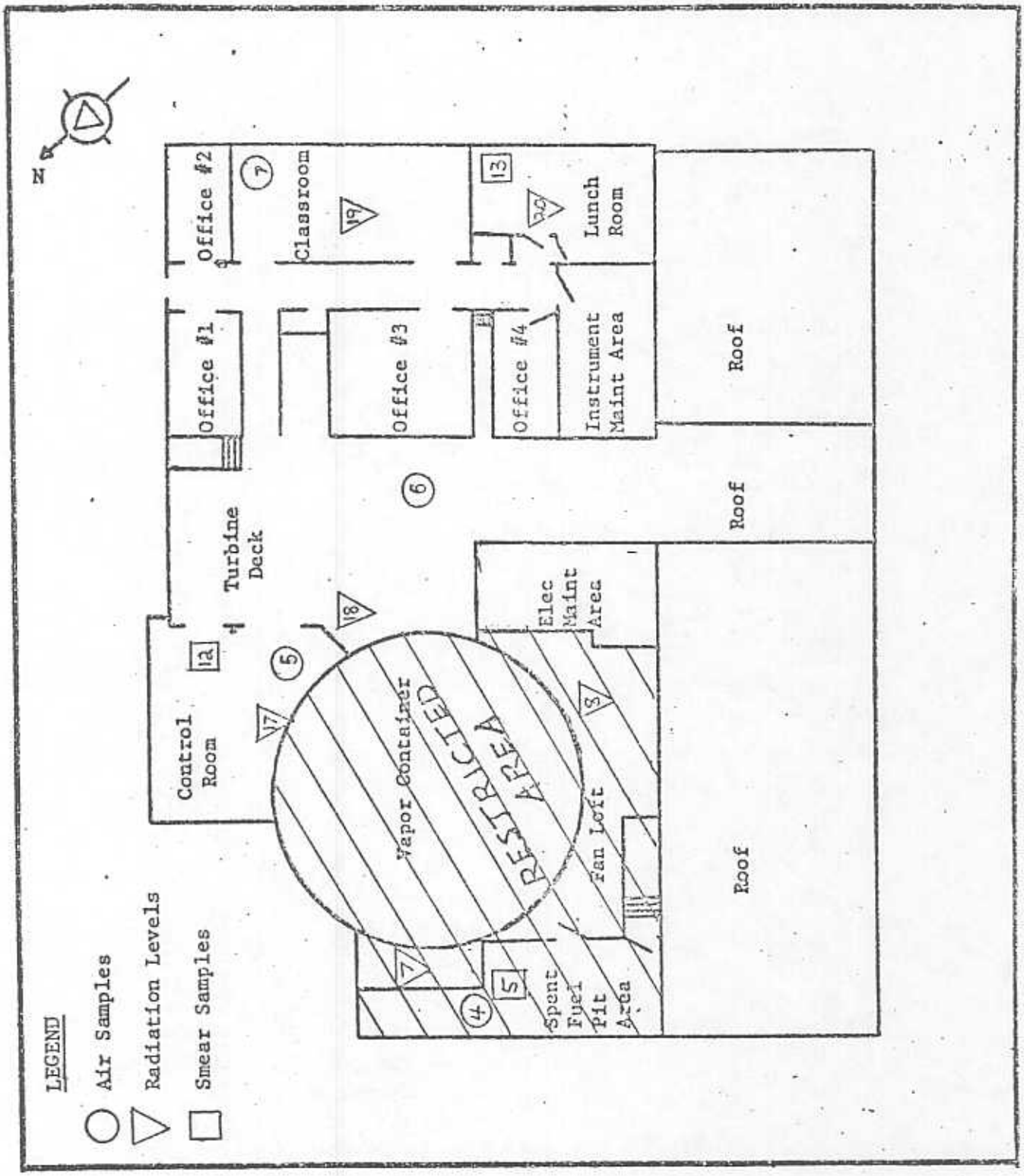

Figure A 3

Post Decommissioning Sample Locations
SM-1 Operating Floor

(4) Fallout - One sample will be taken in the parking lot behind Bldg. 374. The location is shown in Figure A-1.

(5) Radiation - Two radiation stations (TLD) will be set up, one in the parking lot behind Bldg. 374 and one in the parking lot adjacent to Bldg. 358. The locations are shown in Figure A-1.

8. FREQUENCY OF SAMPLING: Table A-3 describes the frequency of sampling. This schedule may be changed if the data indicates such action and upon approval of ARCHS.

9. PROCEDURES: Collecting, processing and counting of samples will be accomplished using as a guideline the methods outlined in the Health Physics-Process Control Reference Manual, dated 1 July 1966 (as amended) or equivalent.

Sample Verification: In the event an individual sample shows abnormally high activity for that particular sample point, the following action will be taken:

a. Verify counting system reliability.

b. If counting equipment is functioning properly, take additional samples to assure reliable condition representation.

c. If the high activity level is verified, an investigation will be conducted to determine the source of the radioactivity. If it is determined the SM-1 site is the source, steps will be taken to correct the situation.

d. A special report will be prepared and forwarded to ARCHS (See para REPORTS).

10. The quantities of principle activities anticipated to be released to unrestricted areas is expected to be insignificant in view of the fact that all operations have ceased and stringent measures have been taken to assure that all radioactivity is contained.

11. The extent to which radioactivity is introduced into the food chain is considered to be negligible.

TABLE A-2 SAMPLING SPECIFICATIONS

TYPE	FREQUENCY*	LOCATION	VOL/EQUIPMENT	ANALYSIS
A. Restricted Areas				
1. Air (particulate)	Code E	See Fig 2&3	1000-1500CF	Long Lived Beta/Alpha
2. Radiation	Code E	See Fig 2&3	TLD	mr/QT
3. Contamination	Code E	See Fig 2&3	Smears	Gross-Beta/Alpha
4. Visual Inspection	Code E	-----	-----	Comment
B. UnRestricted Areas				
1. Air** (particulate)	Code E	See Fig 2&3	1000-1500CF	Long Lived Beta/Alpha Comment
2. Radiation	Code E	See Fig 2&3	TLD	mr/QT
3. Contamination	Code E	See Fig 2&3	Smears	Gross-Beta/Alpha
C. Off-site, On Post				
1. Water				
Station 102	Code A	See Fig 1	1000 ml	Gross-Beta/Alpha
Station 103	Code A	See Fig 1	1000 ml	Gross-Beta/Alpha
2. Sediment Station 403	Code B	See Fig 1	20-30 gms	Gross-Beta/Alpha
3. Soil Station 502	Code B	See Fig 1	20-30 gms	Gross-Beta/Alpha
4. Radiation Station 702 (Bldg 374) Station 701 (Bldg 358)	Code C	See Fig 1	NA	mr/$\frac{yr}{2}$

* See Table A-3
** If Necessary

TABLE A-3

FREQUENCY CODE	DESCRIPTION
A	Monthly for the first year after decommissioning, semi-annually thereafter.
B	One sample per quarter for the first year after decommissioning, semi-annually thereafter.
C	Semi-annual.
D	Monthly.
E	Quarterly.

NOTE: Sampling schedule may be changed upon approval by ARCHS, based upon results of data evaluation.